The Digital Radar Environment Injection Simulator (DREIS): An Interface between DIS/HLA and a Live Radar

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Because of bandwidth limitations, the DIS/HLA environment is usually unable to provide the microsecond-level responses that a live radar expects from its environment. In order to use live radars in a DIS/HLA simulation, an interface is needed that can respond to DIS PDU information and inject appropriate synthesized returns into the radar.

In [1], the authors proposed such an interface. The resulting system was funded by the Army's Threat Systems Management Office (TSMO) and was called the Digital Radar Environment Injection Simulator (DREIS). The DREIS system acts as an interface between the DIS/HLA environment and one of the Army's threat simulator radars.

DREIS receives two primary sets of inputs. First are the DIS Entity State PDU's which are generated at an interval on the order of one second. Second, DREIS receives real-time scheduler information and timing and control syncs from the radar. At the instant when the radar scheduler has defined an upcoming transmission, DREIS interpolates the information in the Entity State PDU to calculate target position relative to the radar. Based on the target's relative range, range rate, aspect angles, modulation signature, and angles off the beam pointing angle, DREIS synthesizes a monopulse return with the correct amplitude, time delay, and Doppler shift. The resulting synthesized return is injected into the radar receiver at IF.

In addition to aircraft and helicopter returns, DREIS also generates clutter returns and target occlusion based on a map read in from a DTED database. DREIS can also accept DIS Emissions PDU's that define a broad range of jamming techniques. Based on the technique type and parameters contained in the Emissions PDU, DREIS can generate spot noise, swept noise, range/velocity gate pulloff, repeater jamming, and responsive spot noise (noise cover pulses).

In a single radar transmission, DREIS can inject three simultaneous point scatterers, one three-trace clutter signature, and three simultaneous jamming sources. The total scenario can contain 120 point scatterers and 20 jammers.

Finally, the DREIS system can operate in a sim-over-live mode in which the radar transmitter operates as usual and receives live returns from the surrounding clutter environment, and the DREIS synthetic targets and ECM techniques are coupled into the receiver, so that the radar receives the superposition of the live and synthetic returns. This provides an additional level of realism to the radar's response.

[1] J.E. Durham and D.W. Fountain, A Digital-Based Radar Environment Simulator which Supports Testing, Training, and DIS Connectivity, *ITEA Modeling and Simulation Symposium*, December 1997.